DOCUMENT RESUME

ED 473 095 SE 067 232

AUTHOR	Dougherty, Barbara J.
TITLE	The "Write" Way: Mathematics Journal Prompts for Grades 5-6.
INSTITUTION	Hawaii Univ., Honolulu. Curriculum Research and Development Group.
ISBN	ISBN-1-58351-016-8
PUB DATE	2002-00-00
NOTE	36p.; For other books in this series, see SE 067 230-235.
AVAILABLE FROM	The Hawaii Algebra Learning Project, Curriculum Research and Development Group, 1776 University Avenue, Honolulu, HI 96822-2463. e- mail: crdg@hawaii.edu; Web site: http://www.hawaii.edu/ crdg.
PUB TYPE	Books (010) -- Guides - Classroom - Teacher (052)
EDRS PRICE	EDRS Price MF01 Plus Postage. PC Not Available from EDRS
DESCRIPTORS	Attitudes; Concept Formation; Educational Change; Elementary Education; *Grade 5; *Grade 6; Humanistic Education; Learning Processes; *Mathematics Education; Problem Solving; Teaching Methods; *Writing Across the Curriculum

ABSTRACT

This book introduces journal-writing prompts in mathematics for grades 5-6. Content prompts, attitudinal or affective prompts, and process prompts are presented. Each of the content prompts relates or connects topics within and outside of mathematics, targeting important or meaningful concepts and skills. The content prompts also provide situations that focus on areas in which students often have misunderstandings or misconceptions. Attitudinal or affective prompts focus on students' feelings about themselves as mathematicians and students of mathematics. The responses to the process prompts can give insight into students' preferences for problem-solving strategies and how they learn or remember. (KHR)

Reproductions supplied by EDRS are the best that can be made
from the original document.

ED 473 095

The "Write" Way

Mathematics Journal Prompts

PERMISSION TO REPRODUCE AND DISSEMINATE THIS MATERIAL IN MICROFICHE ONLY HAS BEEN GRANTED BY

D. Young

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

2B

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☑ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy.

FOR GRADES 5–6

Barbara J. Dougherty

A Publication of the University of Hawai'i's Curriculum Research & Development Group

SE 064 733

BEST COPY AVAILABLE

The "Write" Way

Mathematics Journal Prompts

FOR GRADES 5–6

Barbara J. Dougherty

A Publication of the University of Hawai'i's
Curriculum Research & Development Group

Curriculum Research & Development Group Staff
Arthur R. King, Jr., Director
Barbara J. Dougherty, Director, The Hawai'i Algebra Learning Project
Edith K. Kleinjans, Managing Editor

Consultant: Fay Zenigami

Book and cover design:
Darrell Asato and Wayne Shishido

©2002 by the University of Hawai'i

1 2 3 4 5 6 7 08 07 06 05 04 03 02

All rights reserved.

Printed in the United States of America

Prior written permission must be obtained from the Curriculum Research & Development Group to reproduce or transmit this work or portions thereof in any form or by any electronic or mechanical means, including any information storage or retrieval system, unless expressly permitted by federal copyright law.

Address all inquiries about the program to

The Hawai'i Algebra Learning Project
Curriculum Research & Development Group
University of Hawai'i
1776 University Avenue
Honolulu, Hawai'i 96822-2463

Email: crdg@hawaii.edu
On the Web: http://www.hawaii.edu/crdg/

ISBN 1-58351-016-8

Contents

Introduction 3

Content Prompts 7

I. Number and Operations 7

II. Algebra 13

III. Measurement 16

IV. Geometry 18

V. Data Analysis and Probability 22

Affective/Attitudinal Prompts 23

Process Prompts 25

Using Writing in Your Classes

1. Share with students the rubric you are using.

2. Make copies of the rubric for students to keep in their notebooks and post one copy in the classroom.

3. Give students a practice prompt to write about. Allow about six minutes for them to respond. The practice prompt is usually an affective/attitudinal one. Regardless of the type you select, it should be one that all students can attempt.

4. Have students compare what they wrote with samples of other students' work that you provide. Or ask them to compare work with their partner or table mate.

5. Compare their work with the rubric. Have students focus on three things they could do to move their writing up a level. If their writing is already at the top level, ask them to write another question that this prompt made them think of.

6. Allow three minutes for students to correct or revise their work. (They should strive to reach the two top levels.)

7. Collect the work.

8. For the first writing prompt to be done outside of class, assign a prompt that you think *all* students can write about.

9. When students return to class with their assignment, have them compare their writing with the rubric.

10. Allow two minutes for students to correct or revise their work. (They should strive to reach the two top levels.)

11. Repeat this phase as often as needed to help students understand your expectations for their writing.

The "Write" Way: Mathematics Journal Prompts for Grades 5–6

The *Principles and Standards for School Mathematics* (National Council of Teachers of Mathematics, 2000) includes a separate standard for Communication for grades 3 through 5 and 6 through 8. This standard advocates using multiple activities that give students opportunities to demonstrate their understandings. These tasks should allow students to express themselves in a variety of ways such as with concrete models, pictures or drawings, or abstract symbols. Each of these forms lets students communicate with others about their thinking.

Communication should include at least five types of activities: (1) speaking, (2) reading, (3) listening, (4) modeling or constructing, and (5) writing. The last type can take the form of journal writing.

Journal writing can be structured to give you cohesive and comparable information about students and their thinking while you are challenging them through contextual situations. A structure for journal writing includes (1) mathematical content, (2) students' attitude or affect, and (3) processes.

Journal prompts give situations or questions to which students respond. Responses may include words, pictures or drawings, or symbols. Encourage students to support their ideas and to clearly explain what they mean. They can give specific examples as part of their explanations.

Content prompts relate or connect topics within and outside of mathematics, targeting important or meaningful concepts and skills. They can also provide situations that focus on areas where students often have misunderstandings or misconceptions. The responses to the prompts give teachers (and students) insight into how a student has interpreted a mathematical idea.

Attitudinal or affective prompts focus on students' feelings about themselves as mathematicians and students of mathematics. Students' responses allow you to assess how positive attitudes about mathematics and mathematicians are developing in the classroom environment.

Finally, being aware of how one solves or approaches problems is promoted by **process prompts.** The responses to these prompts can give insight into students' preferences for problem-solving strategies and into how they learn or remember. As students become aware of how they learn and solve problems, they grow stronger in confidence.

Introduction: Grades 5–6

Description of materials

There are at least 100 prompts to choose from. Some of them may be used more than once to ascertain how students are growing in their understandings of and beliefs about mathematics. The prompts may also be used as assessment tasks for expanded response or self-constructed response items.

Each mathematical content prompt includes a short description of what you might expect or consider in students' responses. The mathematical content responses should reflect a student's progress in understanding the concept or skill.

The content prompts were selected to match recommendations from the National Council of Teachers of Mathematics (*Principles and Standards for School Mathematics,* 2000) rather than to fit a specific text. Locate the topic that you are studying and then select the prompt that best fits the class. You may change the wording if students will not understand the terminology or vocabulary used.

Affective or attitudinal prompt responses show students' beliefs. If you use them more than once, you should be able to detect changes in beliefs or feelings about mathematics as a discipline as the year or semester progresses.

Process prompts give students an opportunity to show how they do a mathematical process or algorithm (step-by-step procedure). When you use these prompts, you gain insight into how students have interpreted or altered procedures.

You can use writing prompts daily or intermittently, depending on your class, and you can repeat them from time to time. In prompts that use students' names, feel free to change the names to represent your students. If you use journal prompts daily, we recommend that you use three content prompts, one process prompt, and one attitudinal prompt in a week.

Evaluating students' responses

When we tested journal writing in classes, we found that students tend to give the writing more thought if it is to be scored. One method our writing team used was to score the responses on content rather than on grammar and spelling. We used an essay grading method, reading two or three papers to get a feel for students' responses. These first papers formed the baseline for scoring other papers.

We designed this rubric for scoring journal responses.

4 points: The student's work includes—
- a completed prompt or an answer to the question posed.
- support for statements made by using either examples or counterexamples.
- ideas clearly communicated to the reader.
- legible writing, drawings, pictures, charts or tables, and diagrams.
- accurate mathematics or information.

3 points: Omission of one criterion from level 4.

2 points: Omission of two criteria from level 4.

1 point: Omission of three criteria from level 4.

0 points: Omission of more than three criteria from level 4.

There are many ways to create a rubric. Teachers alone can develop a rubric, or students can work with the teacher to develop a rubric specific to their class. Here are two sample rubrics that have been developed with students' participation.

A five-level scale:

4 **The student's work shows a response that—**
- addresses the question raised in the prompt.
- has correct or accurate mathematics.
- is legible.
- has support or justification for any statements made.
- makes sense to the reader.

3 **The student's work shows a response that—**
- addresses the question raised in the prompt.
- has correct or accurate mathematics.
- is legible.
- does not have fully justified or supported statements.
- makes sense to the reader.

2 **The student's work shows a response that—**
- addresses the question raised in the prompt.
- has some incorrect or inaccurate mathematics.
- is legible.
- does not have justified or supported statements.
- is somewhat clear to the reader.

1 **The student's work shows a response that—**
- addresses the question raised in the prompt.
- has incorrect or inaccurate mathematics.
- is partially legible.
- does not have justified or supported statements.
- does not make sense to the reader.

0 **The student's work shows a response that—**
- does not address the question raised in the prompt.
- has incorrect or inaccurate mathematics.
- is not legible.
- does not make sense to the reader.

A three-point scale:

Exceeds standard The student's work shows a response that—
- addresses the question raised in the prompt.
- has correct or accurate mathematics.
- is legible.
- has support or justification for any statements made.
- makes sense to the reader.

Meets standard The student's work shows a response that—
- addresses the question raised in the prompt.
- has some correct or accurate mathematics.
- is legible.
- does not support or justify some of the statements made.
- makes sense to the reader.

Below standard The student's work shows a response that—
- does not address the question raised in the prompt.
- has incorrect or inaccurate mathematics.
- is not legible.
- does not support or justify statements made.

Although grammar and punctuation are not usually scored, students should communicate their ideas in ways that are understandable. Some students may use drawings, tables, charts, or other means to convey their ideas. Encourage them to use whatever way they need to make their ideas clear.

After the first writing assignment, you can take excerpts from students' papers to illustrate qualities that you consider important. Show comparisons between high- and low-quality responses by putting them on overhead transparencies or photocopying them for all students. Keep the responses anonymous.

Content Prompts: Grades 5–6

You can present the prompt to the whole class and have students share ideas. You can record their ideas on big chart paper or on the board. The chart paper provides a permanent record that can be revisited later in the year to check the progress of students' understanding of or thinking about mathematical concepts or skills. At that time, you can revise students' comments or add new ideas.

If your mathematics program involves parents, you can assign the prompts as homework. The parents can record any textual information the student shares.

You can also use the prompts in a problem-solving context where students create a solution in a group or individually. If groups work on the problems, they can share their ideas before the whole class. If they work individually, you will need to find some way to provide for a sharing of ideas. Either way, their ideas should be recorded for future reference.

I. Number and Operations

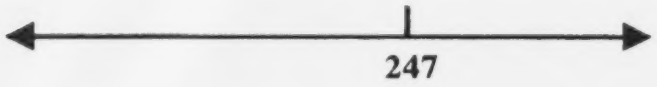
1. **Kim said, "The zero in 13.01 is not really important." Jon thought it was important, but he wasn't sure. What do you think?**

   Expect a discussion about zero being a way to "hold" a place. Students should indicate that the zero is important.

2. **Keisha rounded a number to 85. Find a number that Keisha could have used and explain why it could be rounded to 85. Then find at least two more numbers that could be rounded to 85.**

   Some students may round from tenths or other decimal places (e.g., 84.6 or 85.21). Other students may use whole numbers such as 83 or 86. All responses should include an explanation about why the numbers they selected could be rounded to 85.

3. Hugh found a number line like the one shown. Where on the number line would you find a number smaller than 247? How do you know?



There should be an indication of looking to the left of 247. Number lines typically go from small to large as you move from left to right.

4. Maria has a million one-dollar bills. Do you think she could fit them all into one suitcase? Why or why not? If she could fit them into a suitcase, would she be able to lift it? Explain and support your answer.

You can assign this prompt for extended writing. If you do, allow students about two weeks to complete it. Students should support their ideas with evidence.

5. Addition and subtraction are (or are not) related because . . .

Students may indicate they are related because they are inverse operations or opposite operations. Some students may say they are not related. They may support that response with references to the models for those operations.

6. Samantha asked her teacher why we needed numbers larger than 1,000,000. What do you think her teacher said? Be specific.

Answers will vary. Students' responses often include everyday contexts that require large numbers.

7. **Tasha said, "If I add two even numbers, I get a sum that is even." Twaina said, "If I add two odd numbers, I get a sum that is even." Do you agree with either of these girls? Justify why you agree with her.**

   They are both correct. Students should support their position with specific examples or a word description.

8. **Trebeck, a Martian mathematician, just discovered a new math. She made numbers in her math system and showed what number it represented in our number system.**

   $\Delta\Theta\Theta\iota\iota\iota$ = **123**

   $\Delta\Delta\Delta\Theta\iota\iota$ = **312**

   How would she show 231 in Martian math? Explain her system.

   $\Delta\Delta\Theta\Theta\Theta\iota$ = *231. Their system uses different symbols for place values and the order determines the value of the symbol.*

9. **Darrell made a chart to show equivalent fractions. He wrote "$\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8}$ . . ." What patterns do you notice? What would be the next three fractions in his pattern?**

   Patterns will vary. Some students may notice that the numerator increases by 1 and the denominator increases by 2. Others may comment that the denominators are even numbers. His next fractions are $\frac{5}{10}$, $\frac{6}{12}$, $\frac{7}{14}$.

10. **Sam said, "I ate one half of a pizza, which was three slices." Jena said, "I ate four slices of pizza, and it was one half of a pizza." Who is telling the truth? Prove it.**

    Both could be telling the truth. Sam's pizza could have been cut into six pieces while Jena's was cut into eight pieces.

11. How often do you use fractions, percents, or decimals? Make a list of the times you used them in one day and the situations in which you used them.

Answers will vary. You may want to discuss students' responses as an opening to the study of rational numbers.

12. We need fractions because . . .

Answers will vary. You can substitute other words for fractions, such as percents or decimals. Encourage students to use examples of specific instances where fractions are needed.

13. Write a word problem that can be solved by 37 + 70 = 107.

Answers will vary. Be sure to check the problem to determine if addition is the correct operation.

14. Amanda solved a division problem.

607 ÷ 24 = 25 R7

Tino asked, "What does the remainder 7 mean?" What do you think Amanda told him?

Students may indicate that 7 represents the amount left over when you group the 607 into groups of 24. Or they may indicate that it is the amount left over when you put 607 into 24 groups.

15. Write a word problem that can be solved by multiplying two fractions. Show the solution.

Students should write a problem solved by multiplying. Be sure to check that multiplication is the appropriate operation.

16. You are given a problem to solve that uses the number sentence $1.5 + \frac{3}{4} = \bigcirc$. What would you do first? Why?

There are many steps students can use such as writing in vertical form, changing 1.5 to $1\frac{1}{2}$, or changing $\frac{3}{4}$ to .75. They should support their answers.

17. Darron's calculator is broken. It doesn't always put the decimal point in the right place so he has difficulty deciding if a problem is correct. He added 43.7 + 2.01 + 6.05 + 1. His calculator showed a sum of 527.6. Do you agree with the calculator? Why or why not?

Students should disagree because an estimate of the sum is closer to 52. Some students may show you how to solve the problem with an exact answer. If you notice that students have used number sense or estimation skills, you may want them to share those with the whole class.

18. The difference between a ratio and a proportion is . . .

A ratio compares two quantities. A proportion indicates that two ratios are equal.

19. Jennifer and Patty are arguing about what a rational number is. Describe, using examples, what you think it is.

Answers will vary. It will be interesting to note how many students, if any, indicate that a whole number is also a rational number.

20. Kenyatta asked, "Why do fractions have to have common denominators before they can be added?" What do you think? Support your answer with specific examples.

Responses should indicate that you cannot identify the sum (or the amount) without having some common basis for comparison such as a common denominator.

21. There is only one even prime number, 2. How can you explain that?

An even number after 2 has at least 2 as a factor. Therefore those numbers cannot be prime.

22. "Factors and multiples are related, I think," said Lori. How are factors and multiples related? How are they different?

Students should make a clear distinction between factors and multiples. If you multiply two factors, you get a product that can be divided evenly by either factor.

23. Wen said, "Tony said that one is not a prime number. But I thought it was. Is Tony right?" What would you tell Wen? Be specific.

Students should indicate that Tony is correct. One has only one factor, itself. It does not fit the definition of prime numbers.

24. "Quick," said Janae. "What does it mean if two numbers have a common multiple?" What can you tell Janae? Give examples that will support your answer.

Students will comment on how to determine a common multiple and give examples. Some students may relate multiples to the more specific common multiples. They should give examples that support their explanation.

25. $\frac{1}{6} + \frac{7}{15} = ?$

Is the sum about 0, $\frac{1}{2}$**, or 1? How did you decide?**

Students usually comment on the relations of the numerators and denominators in estimating each fraction. They may show how they estimated. Watch for students who solve and then estimate.

26. My favorite fraction is _____. Write a subtraction problem that uses this fraction. Solve the problem.

Answers will vary. Students should create a problem that gives an appropriate context for subtraction. The solution should be accurate.

27. How do you decide when to use an estimate and when to find an exact answer?

Answers will vary. The explanations that students give should fit the context for an exact answer and the context for an estimate.

II. Algebra

1. Gina put this pattern on the board: 1, 3, 9, 27, 81, . . . Dorina said, "I know her pattern. She is multiplying by 3 each time." Make another number pattern. Describe your pattern in words.

These can be put on notecards and exchanged with other students. You may want to verify that students have used a consistent pattern.

2. 8, 4, 0, –4, –8, . . .

Find three different ways to describe the number pattern. Support your pattern descriptions.

One way is to indicate that four is subtracted from the previous term. A second way is to skip-count backward by four. The third way may be to indicate that the pattern will continue with 8, 4, 0, –4, –8 repeating. If students propose a pattern that can be verified, you should accept it.

3. Shanda was eating a gooey hot fudge sundae last night while she was doing her homework. She dripped some hot fudge on her homework paper. What goes under the blobs of hot fudge?

47 + ▬ + ● = 113

Find at least four possible answers. Justify your answers.

Answers will vary. For example, 33 and 33, 30 and 36, –34 and 100, $33\frac{1}{2}$ and 32.5.

4. Sherman wrote this computation on the board:

$3 + 4 \times 2 - 6 \div 3$

Gayle solved it and got $2\frac{2}{3}$. Johnna solved it and got 9. Who is correct? Why?

Students should indicate that Johnna is correct. Gayle did not use order of operations to do the computations.

5. The equal sign means . . .

Students should give some indication of "sameness" or "balance." Others may say that the amounts on either side of the equal sign are the same.

6. In addition, 2 + 4 gives the same sum as 4 + 2. Is this true for subtraction? Why or why not?

No, it is not true for subtraction. The difference is not the same when the order is reversed.

7. **In multiplication, 2×4 gives the same product as 4×2. Is this true for division? Why or why not?**

   No, it is not true for division. The quotient is not the same when the order of the numbers is reversed.

8. **$O + \Delta = \Delta + O$**

   Find at least four values for O and Δ that make it a true sentence. What do you notice about the values you found?

   Any numbers students use will be appropriate. What they should notice is that the order of the values does not change the sum (Commutative Property).

9. **Find two numbers whose difference is 8. Find 4 more pairs. What do you notice about the pairs?**

   For example, 10 and 2, 12 and 4, $10\frac{1}{2}$ and $2\frac{1}{2}$, –5 and –13. Their observations will vary.

10. **Write a problem that can be solved by $14 - x = 8$.**

    As with other prompts of this type, they can be exchanged the next day for other students to solve. Or students can share them in a group and select the "best" one to share with the class.

11. **How is graphing a point on a Cartesian coordinate system like reading a map?**

    Students' comments will vary, but the process of locating a specific point is similar for both activities. Both use a grid system with locators horizontally and vertically.

12. **Write a short story that uses –7 in it.**

    Answers will vary. The stories can be used in a language arts activity and displayed on a bulletin board. You can add a seasonal flavor by having the story relate to a particular event.

III. Measurement

1. **Tanya asked Je'Lisa to measure a table's height in centimeters. What tool do you think Je'Lisa will use to do the measurement? Why?**

   Students should give a reason for selecting a centimeter stick or a meter stick. Watch for students' responses that only indicate a ruler. A ruler could use inches or feet rather than centimeters.

2. **What is area? Describe and show examples.**

   Students should respond with more than a formula. And there should not be an emphasis on quadrilaterals (specifically squares or rectangles). In some way, students should indicate that area is the measurement of the region inside a shape's boundary.

3. **What is perimeter? Describe and show examples.**

   Students should respond with more than a formula. And there should not be an emphasis on quadrilaterals (specifically squares or rectangles). Students' responses should indicate that perimeter is the distance or length around a shape.

4. **Write a letter describing the difference between volume and area to a fourth-grader.**

   Students should note that volume is used to measure the space inside a three-dimensional shape. Area is the measurement of region within the boundaries of a two-dimensional shape.

5. **The circumference of a circle and the perimeter of a triangle are alike or different because . . .**

   Students' responses usually indicate that both measure the distance around the shape.

6. **"If you convert feet to inches, you divide the number of feet by 12 because there are 12 inches in a foot," said Katye. Buffi argued, "No, you multiply the number of feet by 12." Who do you agree with? Support your answer.**

   Students should agree with Buffi and give a credible rationale.

7. **The area of a rectangle and the area of a triangle are related because . . .**

   Students may relate the area of a triangle to half that of a rectangle (or a parallelogram). Others may comment that area of either shape measures the region inside the boundary of the shape.

8. **Find as many rectangles as you can that have an area of 36 square units. Draw them showing their dimensions. What do you notice?**

   Most students will show whole-number dimensions. They may note that the dimensions are factors of 36.

9. **Don Know said, "Whenever a rectangle's perimeter increases, its area also increases." C. I. Know said, "That's true. I can prove it." Do you think this can be proven? If so, prove it. If not, tell why.**

   Students should give examples to show that it is not true. For example, a rectangle with dimensions of 6×2 has an area of 12 square units and a perimeter of 16 units. Now compare a rectangle with dimensions 9×1. Its area is 9 square units and its perimeter is 20 units. Its perimeter increased, but its area decreased.

10. **Square units are used to measure area because . . .**

    Answers will vary. Students may give the rationale that squares are used because squares can cover a region with no overlaps and no spaces. If you have used tessellations in your class, students may use that technique to explain the uses of squares.

11. **Monica found a triangle that had a perimeter of 15 centimeters. Draw at least four triangles that could have that perimeter. Use a ruler so that the sides of the triangle are the actual measurements.**

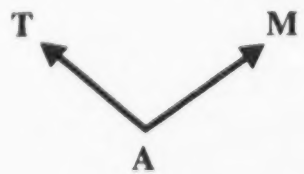
    Watch for triangles not drawn with true measurements. Especially note any triangles that do not have appropriate side measurements, e.g., a triangle with sides of 3 cm, 4 cm, and 8 cm.

IV. Geometry

1. **An example of perpendicular lines that I have seen is . . . I know they are perpendicular because. . .**

   Students may draw or describe the example they have seen. They should provide a description of how they know they are perpendicular. Some students may compare perpendicular lines to corners of papers or other right-angle measures.

2. **If ray AT or ray AM is drawn longer, will it change the measure of <A? Why or why not? Support your answer.**



   Students should note that the size of the angle is not affected by the length of the rays that form the angle's sides.

3. **Kea asked, "Can a right triangle have an obtuse angle?" Shea didn't know what to say. What would you tell Kea? Justify your response.**

   Students should indicate that an obtuse angle is not possible because an obtuse angle measures more than ninety degrees. That would make the total sum of the angles of a triangle more than 180°. They should justify their claim with drawings or a logical explanation.

4. **Pam thought that a rhombus and a square are the same thing. Is she right? Prove it.**

   Students may comment on like qualities such as congruent sides. A square is a special case of a rhombus. Not all rhombi are squares as it is not a requirement that a rhombus have right angles.

5. **Andrew asked, "What is pi used for?" What would you tell Andrew? Support your response with specific examples or details.**

   Answers will vary. Students should comment on the ratio of the circumference to the diameter. Depending on the level of your class discussion, you may decide to accept a reference to work with circles. However, if students comment only on the use of pi in a formula, this will not indicate a deep understanding of pi.

6. **Draw any two-dimensional shape and any three-dimensional shape. Write three ways they are the same and three ways they are different.**

   Answers will vary. Students may comment on the relationship of the faces of the three-dimensional shape to the two-dimensional shape. Others may write about the measurements that can be made on both, such as area and perimeter for two-dimensional shapes and volume and surface area for three-dimensional shapes. To extend this prompt, you can have the class verify the likenesses and differences.

7. **I think that the diameter of a circle and its circumference are or are not related because . . .**

   Students may notice that the ratio of circumference to diameter is pi. Others may show that the diameter is needed to find the circumference if a formula is used.

8. **I think the volume of a cylinder is more than/less than the volume of a cone when the bases are congruent and heights are equal because . . .**

   Depending on the developmental level of the concept of volume, students may notice that cones are $\frac{1}{3}$ the volume of a cylinder with the condition of congruent bases and equal heights.

9. **A cube and a square are alike because . . . But a cube and a square are different because . . .**

   Some students may comment that the face of a cube is a square. Others may mention that the square has two dimensions and the cube has three dimensions. Other similarities may include the congruency of sides or edges. The class can verify the likenesses and differences as part of the math lesson.

10. **I can tell the difference between an acute angle and an obtuse angle because . . .**

    Students may sketch examples or discuss how the angles look different.

11. **To measure an angle, I will use . . .**

    Students should discuss using a protractor or other appropriate tools such as the corner of a sheet of paper to estimate. Other students may comment on the units used in angle measurement. Either would be appropriate.

12. Leilani found five squares of paper. She taped them together to make a cube. Bart said that she needed six squares to make a cube. Who do you agree with and why?

Leilani's "cube" would be an open-top box because a cube consists of six faces. Students should agree with Bart.

13. Can a right triangle also be an isosceles triangle? Justify your answer.

Responses should indicate that it is possible to have an isosceles right triangle. The justification may include a drawing.

14. Draw any triangle. Write a problem involving the triangle. Be sure to label any parts of the triangle necessary to solve the problem.

This is one that can be used in class the next day. Students' problems can be exchanged with other students to solve. Solutions can be discussed.

15. I think the term "altitude" means . . . Make a drawing to support your description of altitude.

Encourage students to use their own ideas and drawings to respond. Check the drawing to be sure that the drawings match the descriptions. Altitudes should be drawn with a right angle.

V. Data Analysis and Probability

1. **Marissa said, "The teacher said we are going to study probability. I have no idea what that means." What would you tell Marissa?**

   Answers will vary. Students should describe some aspect of probability.

2. **Statistics is the study of . . .**

   Answers will vary. Students should describe some aspect of statistics.

3. **The graph I think I know the most about is the _____ graph because . . . Show a sketch of your graph.**

   Answers will vary. The sketch should match the name of the graph given. Students' responses will help you determine what knowledge students have of graphs and graphing. This prompt can be used as the introductory prompt before students start studying graphs.

4. **If I know the mean (or average) of a set of data, I know that . . .**

   Students will comment on what a "mean" signifies to them. Watch for comments that relate to the notion of "middleness."

5. **I would use a circle graph to show . . .**

   Students should discuss the types of data appropriate for a circle graph. Or they may comment on the way data are displayed on a circle graph. The visual perspective of a circle graph quickly shows proportional relationships among the data.

Affective/Attitudinal Prompts: Grades 5–6

1. **When I am in my math class, I feel _____ because . . .**

2. **Write a letter to your best friend describing what happens in our math class.**

3. **Draw a picture of a mathematician on a typical work day. Describe the mathematician's work.**

4. **What does a mathematician do for fun?**

5. **I think a math student is (or is not) a mathematician because . . .**

6. **I will probably (or probably not) take more math classes in high school because . . .**

7. **Pick a song that shows how you feel about math. Describe why it shows your feelings.**

8. **If I could change one thing about our math class, it would be . . .**

9. **A job that uses a lot of math is _____ because . . .**

10. **Real-life math means . . .**

11. **Using group work in math makes me feel _____ because . . .**

12. **Math is . . .**

13. **Problem solving is . . .**

14. **Geometry is . . .**

15. **When I study probability, I think I will learn . . .**

16. **My favorite thing in math this year was when . . .**

17. **My math class last year was the same as (or different from) this year's class because . . .**

18. **My parents (or guardians) did (or did not) like math because . . .**

19. **To be a better math student, I need to . . .**

20. **If I had to solve 25,768 ÷ 37, I would (or would not) use a calculator because . . .**

21. **Computers are (or are not) useful in math because . . .**

22. **How could you show that math and science are related?**

23. **The one tool that is used most to do math is the _____ because . . .**

24. **Draw a picture of a "perfect" math student. Describe why your student is perfect.**

25. **If I could change one thing about myself as a math student, it would be . . .**

Process Prompts: Grades 5–6

1. **Draw a picture of how you do your homework. Describe what you do when you do your homework.**

   Answers will vary. Students' pictures should be related to the description they write.

2. **To study for a math test, I . . .**

   Answers will vary. If you find that some students have good study strategies, you may want to have them share those strategies with the whole class. Or you may mention some of the techniques that students use to help them get good test scores.

3. **Mark made a diagram that shows the process he uses to solve a word problem.**

   Read problem =>Try to figure out what it means=> Read it again=> Try a plan=> Solve it

   Make a diagram like Mark's to show how you solve a word problem.

   Answers will vary. Have students discuss their processes within their groups or pairs. You may want students to share their processes as they discuss non-routine or other problem-solving tasks.

4. **When I see a word problem, I first _____. Then I . . .**

   Answers should indicate how students first approach a problem. They may indicate some important strategies that should be shared with the class.

5. **Explain to a fourth-grader how to estimate using fractions. Use specific examples to show how your method works.**

   Students may use the notion of benchmarks to estimate. The method that students describe should be applicable to a wide range of fractions, not just for specific cases.

6. **The problem-solving strategy I use the most is _____ because . . .**

   Note the strategies that students indicate they use. This will be helpful when discussing non-routine or other problem-solving tasks. You can ask students to describe why a particular problem-solving strategy works with a specific problem type.

7. **Describe how you decide whether to use paper and pencil, a calculator, a computer, or mental math to solve a problem.**

   Answers will vary. The techniques that students use to decide can provide insight into students' repertoire of algorithms and other methods.

8. **Describe how you remember the order of operations.**

   Students typically write about a mnemonic device such as Please Excuse My Dear Aunt Sally (PEMDAS). If those mnemonics appear, you can use them in your discussion about order of operations.

9. **I would understand geometry ideas better if . . .**

   Students will usually indicate techniques that support their learning. You may want to use some of their strategies or suggestions in planning and delivering your lessons.

10. Learning mathematics is easier when I . . .

Students indicate techniques that they have found useful in promoting their understandings. If you are shifting the style of instruction, this information is useful as you help students acclimate to a new class environment.

11. Draw a picture of what you look like when you are in math class.

The picture students draw will give an indication of their perception of their role in the mathematics class as well as their attitude about being in a math class.

12. Learning math is the same as (or different from) learning how to read because . . .

Students' responses will help you use students' learning or learning techniques from other disciplines to teach mathematics.

13. The most important thing to learn about in math is . . .

Students' responses will indicate what they find relevant from a mathematics course.

14. To help me understand how to do operations or computations with fractions, I would change my math book so that . . .

Students' responses will help you plan math lessons with fractional computations to meet students' needs.

15. When I need to round a number, I think . . .

Answers will vary. Students should give an appropriate means of rounding. This may entail establishing benchmark numbers or having rules about when to round up or round down.

16. I can justify my answer to a subtraction problem by . . .

The method students use should be related to a property of subtraction or to the inverse relationship subtraction has with addition.

17. In real life, sometimes I underestimate or overestimate because . . .

Students' descriptions of the contexts in which they underestimate or overestimate should be appropriate.

18. When I compare the size of two numbers, I think . . .

Students' methods for comparing numbers can be related to place value. However, if students refer to the number of digits, this is not an appropriate method as 1.21 has more digits than 12 but it is not larger.

19. When I add four- or five-digit numbers, I . . . Describe how you add large numbers.

Students' methods may describe regrouping techniques or estimation strategies to predict the number of digits in the sum.

20. When I read my math book, I . . .

It is important that students learn the difference between how to read a math book and how to read a book for pleasure. You can use students' responses to model reading techniques.

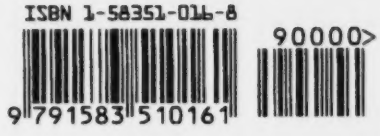
21. The thing I understand the most in math is _____ because . . .

Students' responses will give you an indication of students' understandings. You can make this journal prompt more specific if you wish.

22. The thing I think I need more work on in math is _____ because . . .

Students' responses will indicate areas where students need more work. It will help you plan your lessons.

ISBN 1-58351-016-8



U.S. Department of Education
Office of Educational Research and Improvement (OERI)
National Library of Education (NLE)
Educational Resources Information Center (ERIC)

NOTICE

Reproduction Basis

☒ This document is covered by a signed "Reproduction Release (Blanket)" form (on file within the ERIC system), encompassing all or classes of documents from its source organization and, therefore, does not require a "Specific Document" Release form.

☐ This document is Federally-funded, or carries its own permission to reproduce, or is otherwise in the public domain and, therefore, may be reproduced by ERIC without a signed Reproduction Release form (either "Specific Document" or "Blanket").